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EXAMINER

KEMMERLE III, RUSSELL J

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.



### **DETAILED ACTION**

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

### ***Claim Rejections - 35 USC § 103***

Claims 8-12 and 14-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida (US Patent 6,660,420) in view of Koga (US Patent 6,517,338) and Quadackers (US Patent 5,733,682).

Yoshida discloses a method for forming a separator (i.e., an interconnector) for a fuel cell comprising a two step pressing operation. The process includes pressing the powder to a shape similar to a final desired shape to create a preliminary molded member, then further pressing the preliminary molded member to create a molding of the final desired shape (Col 4 lines 12-16). The separator is generally plate-like with a plurality of knob like protrusions (See Fig. 1). While the angle of inclination is not specifically given, it appears from the drawings to be approximately 90° (see Figs. 3, 4B and 6). Yoshida further discloses that the dimensions of the preliminary molded member in the direction of the molding pressure (i.e., the height of the knobs) are about 1 to 2 times the dimensions of the final molded member.

Yoshida does not disclose that in the second pressing steps the angle of inclination is increased to between  $95^{\circ}$  and  $170^{\circ}$ .

Koga teaches a method of pressing a powder into a desired shape using a set of molding dies to create a fuel cell separator having a number of protrusions extending from the base plate of the separator. Koga discloses that the dies include holes used to form the protrusions which could have an inside wall that is not perpendicular to the other surface, but is instead inclined at a given angle so that the diameter of a protrusion would decrease as it moved away from the base plate (Col 5 lines 7-21). The angle of inclination formed between the base plate and the protrusion is stated as preferably being between  $91^{\circ}$  and  $100^{\circ}$  (Col 5 lines 14-15), and appears to be approximately  $105^{\circ}$  in Fig. 6, however Koga further notes that inclined walls of the die need only to have a inclined (i.e., not perpendicular) inside wall, and that any inclination or shape (i.e., the walls do not need to be linear) would work (Col 5 lines 18-21).

Yoshida and Koga do not disclose that the powder used be selected from the group consisting of metallic and ceramic materials, and specifically be an alloy having at least 20 wt% of chromium (Cr) component (claim 13), or that the alloy contain Cr, iron (Fe) and one or more metallic or ceramic alloy of at most 40 wt%.

Quadakkers discloses a bipolar plate (i.e., interconnector or separator) for a fuel cell and a metal and ceramic composition of the same which must be sintered to obtain the final product. One composition specifically disclosed by Quadakkers include (all percentages given are based on weight) 20% Cr, 5% aluminum (Al), 0.5% Yttrium

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Oxide ( $Y_2O_3$ ), balance (74,5%) Fe, this composition is said to have superior corrosion resistance (Col 2 lines 1-3, 13-14, see also claim 6).

It would have been obvious to one of ordinary skill in the art, at the time of invention by applicant, to have modified the method of forming a fuel cell separator by a two step pressing process as taught by Yoshida with the second pressing step reducing oversized knobs down to a final desired size with the fuel cell separator pressing process taught by Koga where the angle of inclination between the base plate and the knob-like protrusion is greater than  $90^\circ$  during the pressing step reducing the powder to a near net final shape, since Koga discloses that having such an angle makes it easier to release the pressed piece from the die (Col 5 lines 20-21).

It would have been further obvious to one of ordinary skill in the art at the time of invention by applicant to use the composition taught by Quadakkers and discussed above in the process of Yoshida and Koga since Quadakkers discloses that such a composition is effective as a fuel cell separator and creates a separator with increased corrosion resistance. One would have been motivated to do so since all three references are directed toward an interconnector of a fuel cell, and Yoshida and Koga discuss the advantages of using near final shape press molding to create the interconnector, while Quadakkers discloses the advantages of using the material discussed above in creating such an interconnector.

Referring more specifically to the limitations in claim 11, Yoshida and Koga do not specifically disclose that the angle of inclination between the base plate and the knob-protrusions after the first pressing be between  $110^\circ$  and  $130^\circ$ , and be increased by

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the second pressing to between  $115^{\circ}$  and  $160^{\circ}$ . However, it would have been obvious to one of ordinary skill in the art at the time of invention by applicant that the angle of inclination taught by Koga, as discussed above, could include angles in both of those ranges. It would have been obvious that the angle of inclination should be greater than  $90^{\circ}$  during both the first and second pressing operations in order to obtain the benefit disclosed by Koga of allowing for easier release from the molds. It would have been further obvious that the angle be increased in the second pressing step since that would be the most obvious method of ensuring that the protrusion was uniformly subjected to the pressing force of the second step to result in a further pressed piece as taught by Yoshida, while still allowing for the increased ease of removal as taught by Koga.

Referring to claim 12, Yoshida and Koga do not specifically disclose a pre-sintering step after the first pressing stage. It is well known in the art that when a powder is pressed which include known additives to assist in forming the mold (such as a binder or lubricant), that these materials should be burned off prior to sintering by heating the molding to a at temperature which those additives volatilize and are thus removed from the molded piece. It would have been obvious to one of ordinary skill in the art at the time of invention by applicant that when a powder which uses additives is used to form the molding, that a pre-sintering step be used to remove those additives after the piece is molded and before the piece is finally sintered.

Referring to claim 15, Yoshida, Koga and Quadakkers are relied upon as discussed above, further they all discuss where the molding produced is an interconnector or separator for a fuel cell.

***Response to Arguments***

Applicant's arguments filed 28 April 2009 have been fully considered but they are not persuasive.

Applicants first argue that the prior art does not suggest the claimed two step-pressing operation including an increase in the angle of inclination.

This is not found to be persuasive because, as discussed above, Yoshida discloses a two step pressing operation, and that one of ordinary skill in the art would have found it obvious to modify this by using the increased inclination angle as taught by Koga to allow for easier release of the molded body during all stages of processing. It would have been further obvious that the angle be increased in the second pressing step since that would be the most obvious method of ensuring that the protrusion was uniformly subjected to the pressing force of the second step to result in a further pressed piece as taught by Yoshida, while still allowing for the increased ease of removal as taught by Koga.

Applicants also request reconsideration of the previous filed Sigl declaration, stating that the opinions provided by an expert must be accepted as facts or in lieu of facts.

Although factual evidence is preferable to opinion testimony, such testimony is entitled to consideration and some weight so long as the opinion is not on the ultimate legal conclusion at issue. While an opinion as to a legal conclusion is not entitled to any weight, the underlying basis for the opinion may be persuasive. *In re Chilowsky*, 306 F.2d 908, 134 USPQ 515 (CCPA 1962). Thus, Dr. Sigl's opinions on what one skilled in

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the art would or would not find obvious is not entitled to weight since it is drawn to the ultimate legal conclusion, however any facts which are used to form the basis of such opinion may have some probative value.

In item 12, Dr. Sigl opines that those skilled in the art had available to them only MIM and WPP as the available processes for molding Cr alloy powders to near-final shape. However, this opinion does not appear to be supported by facts in the record. Quadackers states that Cr alloy powders may be molded to near final shape by powder metallurgical methods, and gives as examples MIM and WPP. However, there is no reason or explanation why this citing of exemplary methods would lead one skilled in the art away from other known powder metallurgy methods, such as pressing. Since there does not appear to be any factual basis underlying Dr. Sigl's opinion of what one skilled in the art would find obvious, this is not found to be persuasive to overcome the above rejection.

Dr Sigl also discusses (items 14-16) that one skilled in the art of powder metallurgy would not have used a pressing method (which he admits was a known powder metallurgy method) based on DIN 30910 detailing difficulty pressing iron-based stainless steels with a Cr content of 16-19 mass%.

However, there is no explanation of why this should be considered relevant to the current inquiry, as it does not appear to be commensurate in scope with the current claims. Dr. Sigl discusses specifically stainless steel with a Cr content of 16-19%, while the current claims (and the composition of Quadackers) are directed to metal powders having a Cr content of over 20%. It is also not addressed if there are any other

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differences between that of DIN 30910 and the current invention (and the composition of Quadackers) that may result in expected differences from DIN 30910.

Thus, when given the proper weight, the declaration of Dr. Sigl is not found to be persuasive to overcome the *prime facie* case of obviousness set forth above.

Applicants further provided pictures showing the results of apparently pressing graphite powder in the molds of the current process.

Applicants state that these are not intended to have the weight of evidence at this time. It is noted that the pressing of graphite powder in presses used in the current invention does not appear to have any relevance to the current application. It is further noted that one skilled in the art would expect to simply be able to substitute a graphite powder for a Cr-alloy powder and expect the exact same process to work without modifications. As is common with changing materials, there are differences between the materials which are understood by those skilled in the art, and they would be able to account for those differences in order to account for those differences. Such customary changes would be within the abilities of those skilled in the art, and would have been obvious based on the teachings of the prior art, as discussed above.

### ***Conclusion***

Applicant's amendment necessitated any new grounds of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to RUSSELL J. KEMMERLE III whose telephone number is (571)272-6509. The examiner can normally be reached on Monday through Thursday, 7:00-5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on 571-272-1189. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/R. J. K./  
Examiner, Art Unit 1791

/Eric Hug/  
Primary Examiner, Art Unit 1791